Western Cape Government
Education
FOR YOU

CAPE WINELANDS EDUCATION DISTRICT

MATHEMATICS PAPER 2

GRADE 12

COMMON MID-YEAR EXAMINATION

MAY/JUNE 2026

MARKS: 150

TIME: 3 hours

This question paper consists of 14 pages and 1 information sheet and an answer book of 25 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 questions.

2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.

3. Clearly show ALL calculations, diagrams, graphs, etc. that you have used in determining your answers.

4. Answers only will NOT necessarily be awarded full marks.

5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.

6. If necessary, round off answers to TWO decimal places, unless stated otherwise.

7. Diagrams are NOT necessarily drawn to scale.

8. An information sheet with formulae is included at the end of the question paper.

9. Write neatly and legibly.

QUESTION 1

The monthly electricity usage (in kW) of 15 households is recorded below:

Household	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Monthly electricity usage (in kW)	120	150	180	200	220	250	275	300	330	360	400	450	520	600	750

1.1 Calculate the mean of the data. (2)

1.2 Calculate the standard deviation of the data. (1)

1.3 Determine the number of values within one standard deviation of the mean. (2)

1.4 The municipality introduces a penalty: any usage above 500 kW is increased by p%.
After adjustment, the new mean becomes 360 kW.
Calculate the value of p. (4)
[9]

QUESTION 2

The table below shows the distance (in km) travelled to work by 80 employees.

Distance (km)	Number of employees
$0 \leq x < 5$	8
$5 \leq x < 10$	14
$10 \leq x < 15$	22
$15 \leq x < 20$	18
$20 \leq x < 25$	12
$25 \leq x < 30$	6

2.1 Write down the modal class. (1)

2.2 Complete the cumulative frequency column. (2)

2.3 Draw an ogive on the grid provided. (4)

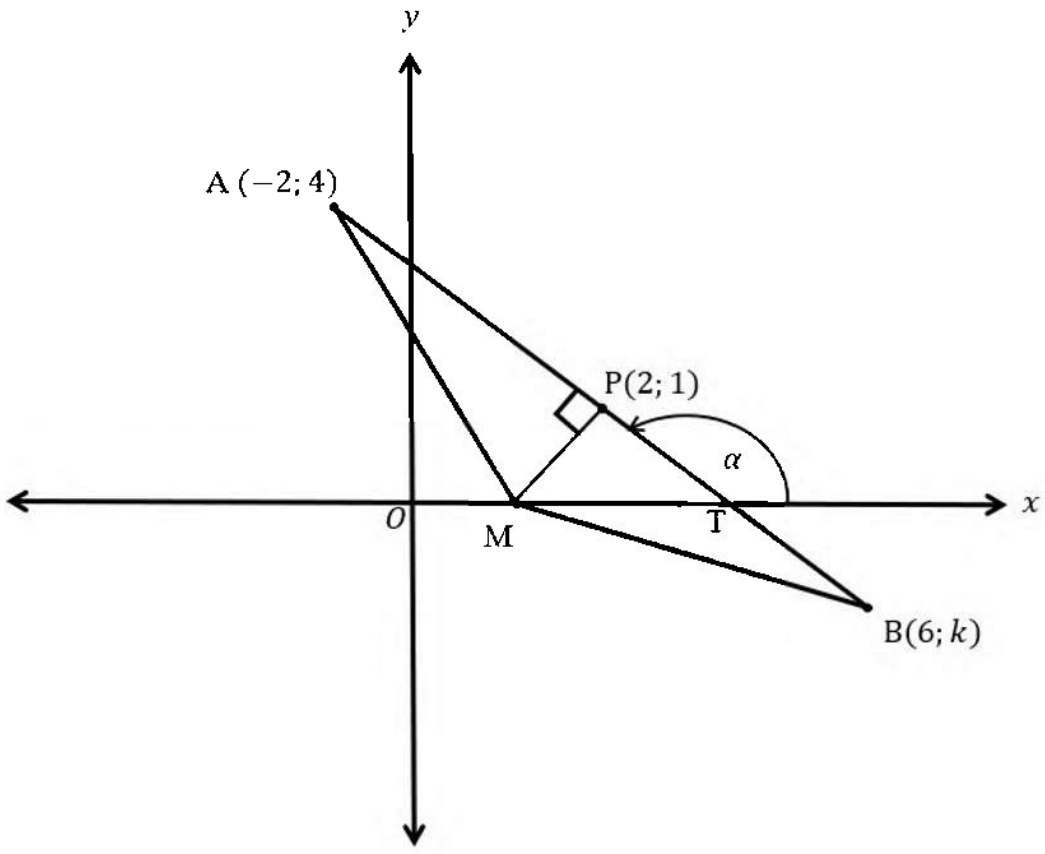
2.4 Use the ogive to estimate the upper quartile. (1)

2.5 The company relocates 8 employees from the $20 \leq x < 25$ class interval to 10 km closer to work. Calculate the new estimated mean distance. Show ALL working. (3)

[11]

QUESTION 3

In the diagram below, A$(-2\,;\,4)$ and B$(6\,;\,k)$ are the endpoints of line AB. Line AB intersects the x −axis at point T. MP is the perpendicular bisector of line AB, with coordinate P$(2;1)$ on AB, and M on the x-axis. The inclination angle of line AB is α.



3.1 Calculate the gradient of AB. (2)

3.2 Calculate the value of k. (2)

3.3 Hence determine the length of AB. (2)

3.4 Show that the equation of MP is $y = \frac{4}{3}x - \frac{5}{3}$ (3)

3.5 Hence, determine the coordinates of M. (2)

3.6 AMBS is a parallelogram. Determine the coordinates of S. (2)

3.7 Determine the size of α. (2)

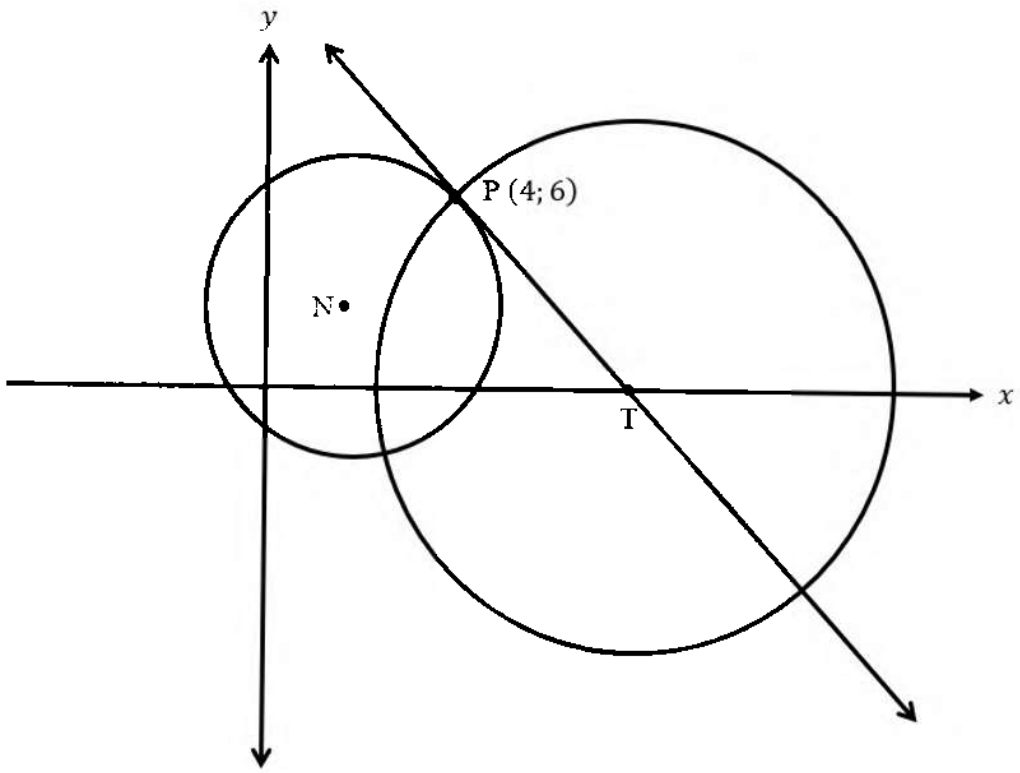
3.8 Hence, determine the size of $\widehat{MAB}$. (4)

3.9 Calculate the area of $\triangle MAB$. (3)

[22]

QUESTION 4

In the diagram, N is the centre of the smaller circle with the equation $(x-1)^2+(y-2)^2=25$. Point T lies on the x- axis and is the centre of a second larger circle. The two circles intersect at $P(4;6)$. Line PT is a tangent to the smaller circle at P.



4.1 Write down the coordinate of N, the centre of the smaller circle. (2)

4.2 Write down the radius of the smaller circle. (1)

4.3 Determine the $y-$intercepts of the smaller circle N. (4)

4.4 Determine the equation of the circle with midpoint T in the form $(x-a)^2+(y-b)^2=r^2$ (7)

4.5 The radius of the smaller circle is reduced so that the circles only touch once. Determine the new radius of the smaller circle. (4)

[18]

QUESTION 5

5.1 If $\sin 19° = t$, express the following in terms of t:

5.1.1 $\cos 19°$ (2)

5.1.2 $\sin 38°$ (2)

5.1.3 $\sin 101°$ (4)

5.2 Simplify the following:

$$\frac{\tan(180° - x)\cos(90° - 2x)}{\tan 225°.\sin(x - 360°)}$$ (8)

5.3 Find the general solution of the equation:

$$\frac{\tan^2 x + 1}{4} = 1$$ (5)

5.4 Prove the identity:

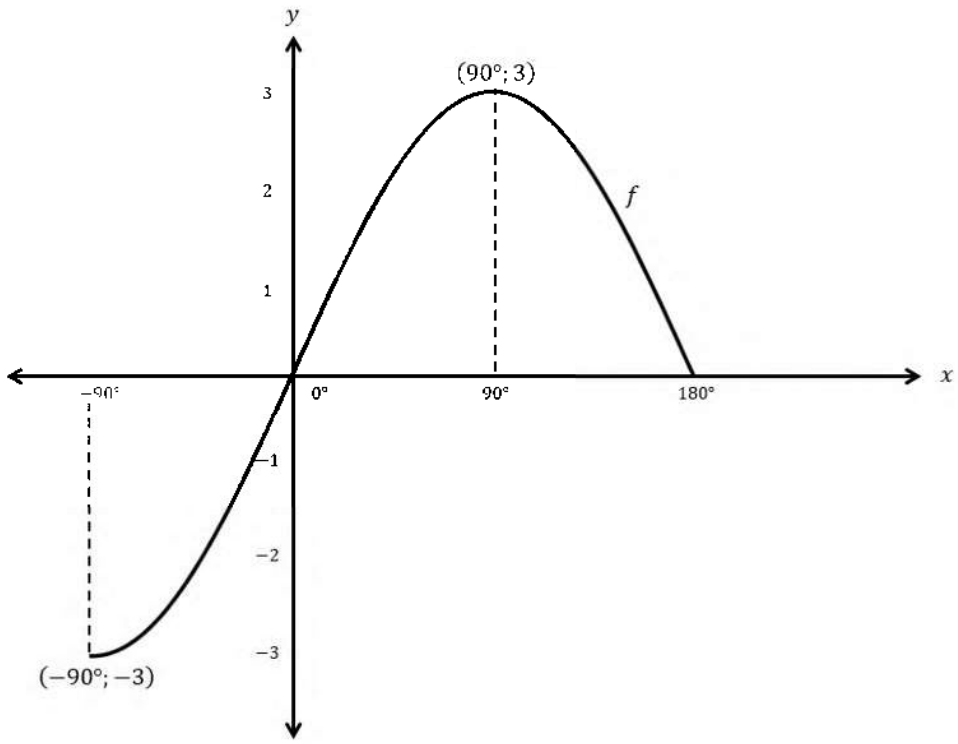
$$\frac{\sin 2A + \sin A}{\cos 2A + \cos A + 1} = \tan A$$ (5)

5.5 Show that if $\sin\theta = 2p$ and $\cos\theta = p$, then $p = \pm\frac{\sqrt{5}}{5}$. (4)

[30]

QUESTION 6

In the diagram the graph of $f(x) = a \sin x$ is drawn for the interval $x \in [-90° ; 180°]$.



6.1 Write down the value of a. (1)

6.2 For which values of x for which $f(x) > 0$. (2)

6.3 Draw the graph of $g(x) = 3 \sin x - 1$ for the interval $x \in [-90° ; 180°]$ on the axes provided in the ANSWER BOOK. Clearly show the y-intercepts and turning points of the graph. (2)

6.4 Write down the period of $g(2x)$. (1)

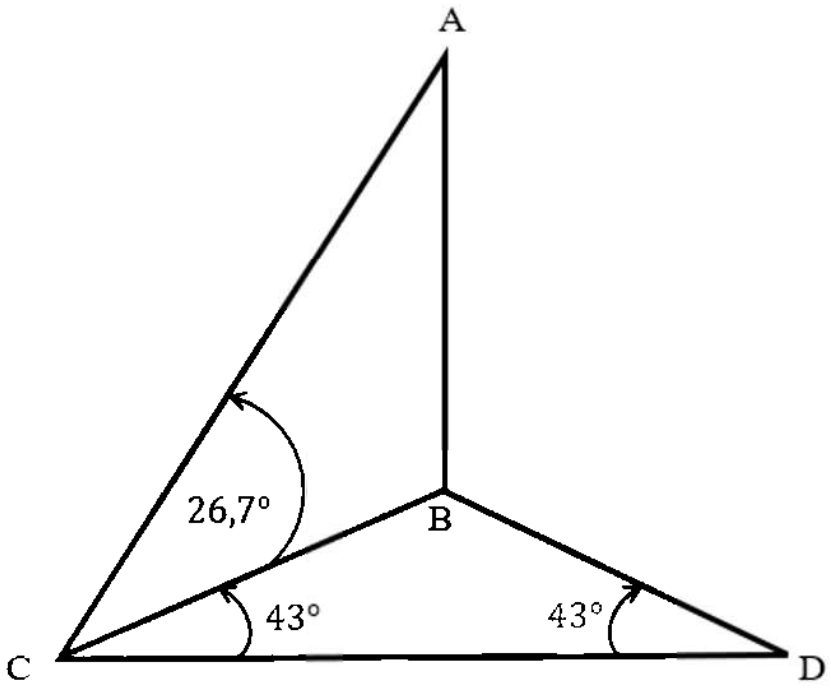
6.5 Calculate the values of x for which $g(x) \geq 1$ in the interval $x \in [-90° ; 180°]$. (3)

6.6 The graph of h is obtained by reflecting g about the x-axis and translated 90° to the left. Write down the equation of h in its simplest form. (3)

[12]

QUESTION 7

In the diagram, a vertical tower AB is observed from two points, C and D, in the same horizontal plane as point B, the foot of the tower. From C, the angle of elevation of A is $26{,}7°$ and $B\hat{C}D = B\hat{D}C = 43°$.



7.1 Write BC, in terms of AB in ΔABC. (2)

7.2 Hence, prove that the height of the tower is given by:

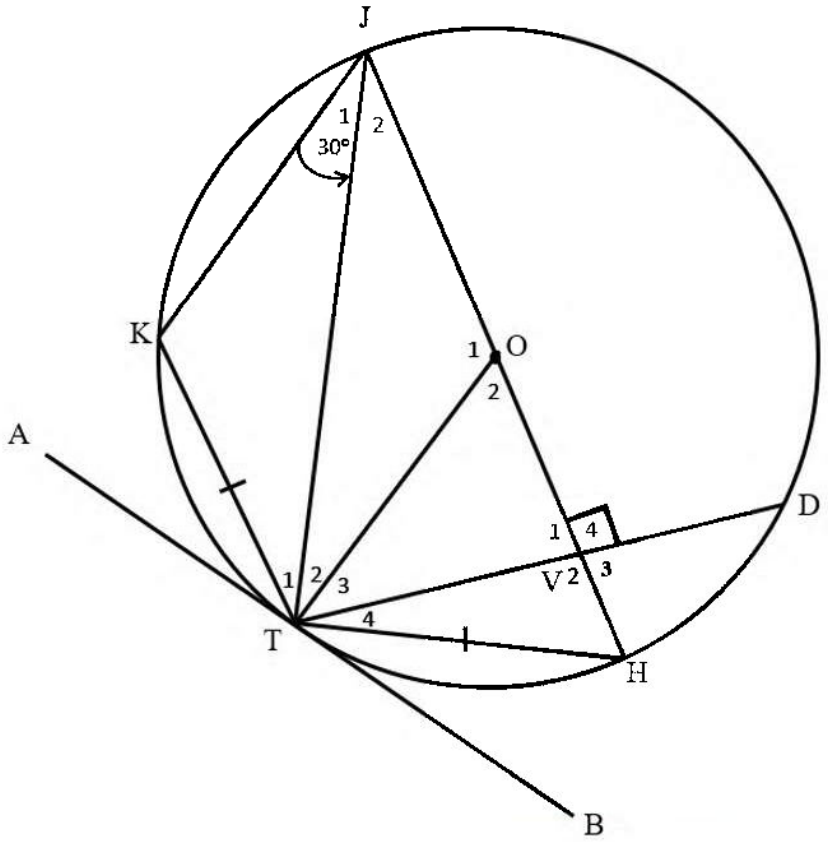
$$AB = \frac{CD.\sin 43°.\tan 26{,}7°}{\sin 94°}$$ (4)

7.3 If it is further given that C and D are 120 metres apart, calculate the length of AB. (2)

[8]

QUESTION 8

In the diagram, O is the centre of the circle JDHTK. The diameter JH is perpendicular to chord TD at V. AB is a tangent to the circle at T. JK, JT and HT are chords of the circle. KT = HT and $\hat{J}_1 = 30°$.



8.1 Provide a reason why $\hat{J}_2 = 30°$ (1)

8.2 Determine, with reasons, the size of:

8.2.1 $\hat{O}_2$ (2)

8.2.2 $\hat{K}$ (5)

8.2.3 $\hat{T}_2$ (1)

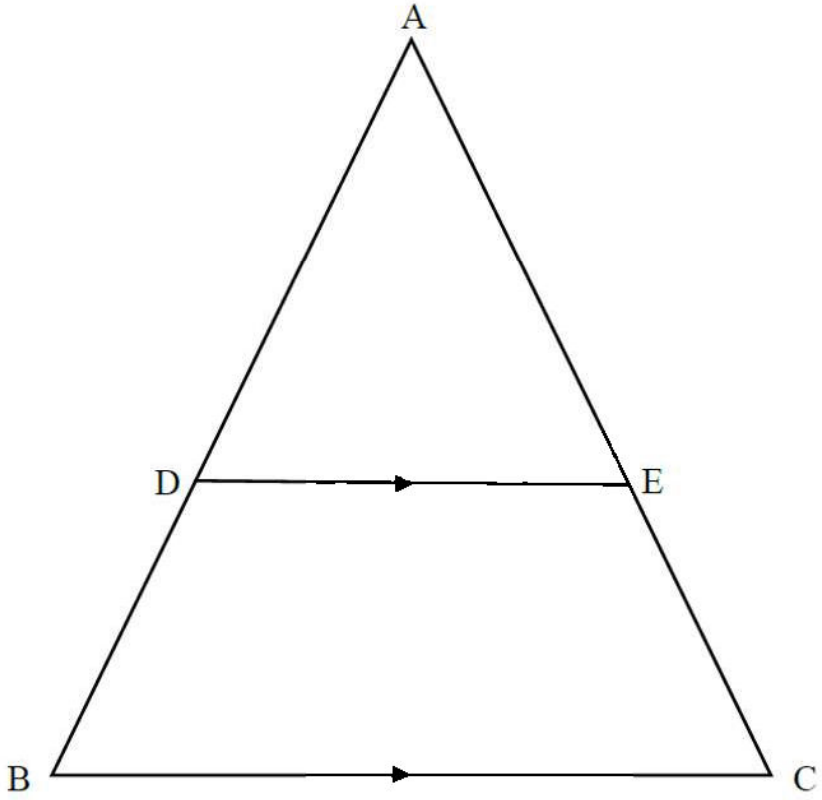
8.3 Determine the length of JT, if it is given that DT $=10\sqrt{3}$ and OT = 10. (3)

[12]

QUESTION 9

9.1 In the diagram below, ΔABC is drawn. D is a point on AB and E is a point on AC such that $DE||BC$.

Use the diagram to prove the theorem which states that $\frac{AD}{DB} = \frac{AE}{EC}$

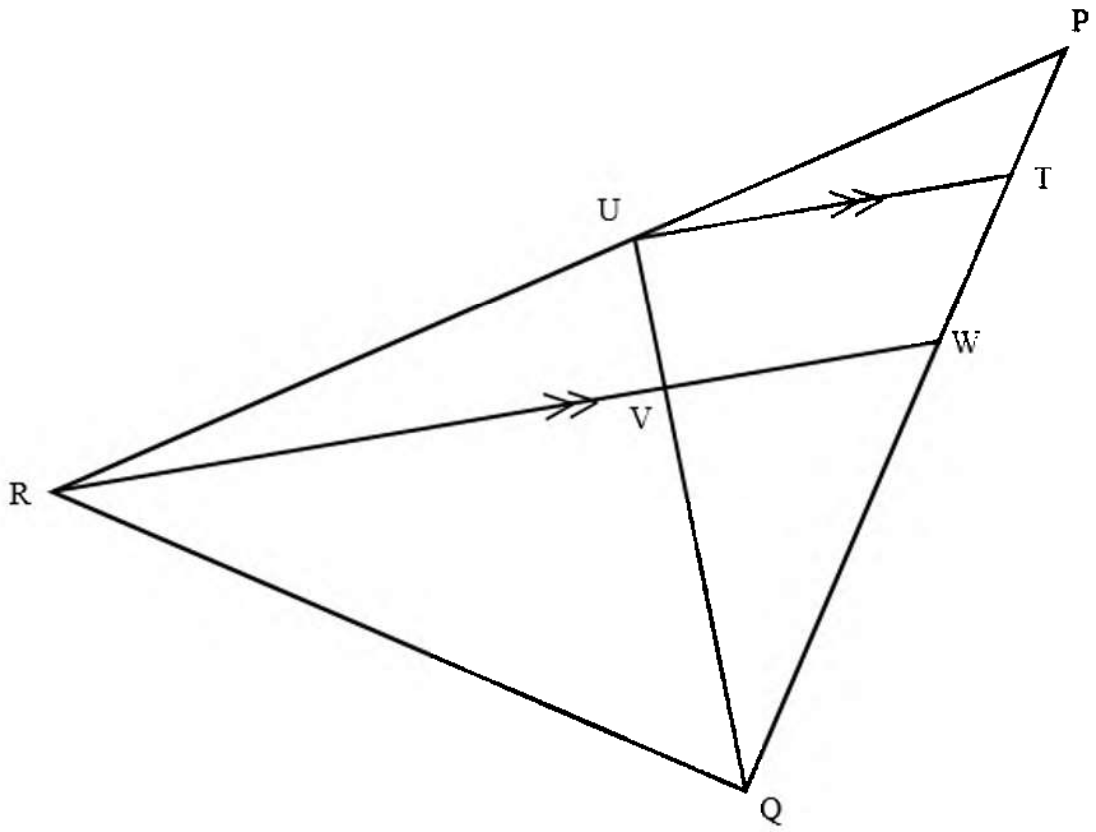


(5)

9.2 In the diagram T, U and W are points on ΔPQR. TU ∥ RW and UVQ is a straight line with V on QU and RW.

$PW : PQ = 3 : 8$

$2PU = UR$



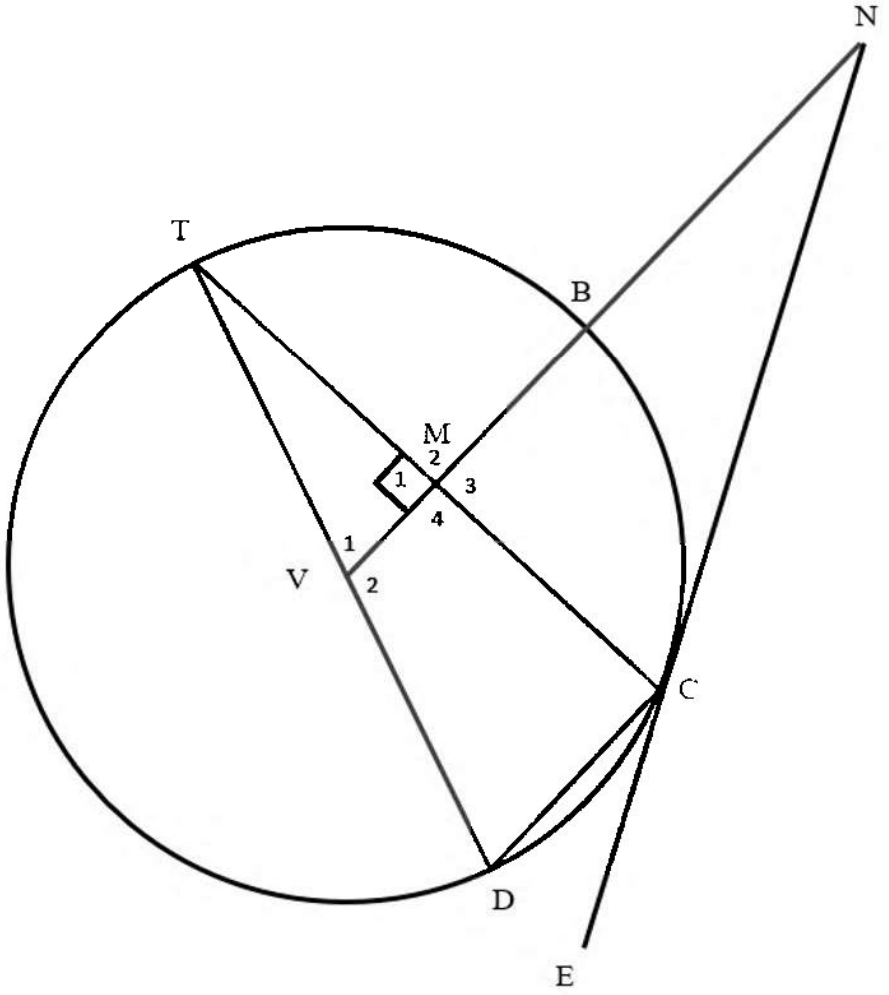
9.2.1 Calculate the ratio of $\frac{VQ}{VU}$ (4)

9.2.2 Calculate the ratio of $\frac{\text{Area } \Delta UPQ}{\text{Area } \Delta RPW}$ (3)

[12]

QUESTION 10

In the diagram TD is a diameter of circle TBCD. Chord TC meets tangent NE at C. Straight line NB is produced to V and intersects TC at M with V on TD. TC ⊥ NV at M.



10.1 Prove that NV ∥ CD. (3)

10.2 Prove that TNCV is a cyclic quadrilateral. (4)

10.3 Prove that $\Delta TMV \;|||\; \Delta NMC$ (3)

10.4 If it is further given that $NM = 2TM$ and $TM = MC$, prove that:

$$MV = \frac{NC^2}{4NM} - \frac{MC^2}{4NM}$$ (6)

[16]

TOTAL: 150 MARKS

INFORMATION SHEET

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1+ni) \qquad A = P(1-ni) \qquad A = P(1-i)^n \qquad A = P(1+i)^n$$

$$T_n = a + (n-1)d \qquad S_n = \frac{n}{2}\left[2a + (n-1)d\right]$$

$$T_n = ar^{n-1} \qquad S_n = \frac{a\left(r^n - 1\right)}{r-1} \;; r \neq 1 \qquad S_\infty = \frac{a}{1-r} \;;$$

$$-1 < r < 1$$

$$F = \frac{x\left[(1+i)^n - 1\right]}{i} \qquad P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad \mathrm{M}\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

$$(x-a)^2 + (y-b)^2 = r^2$$

In ΔABC: $\qquad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

$$a^2 = b^2 + c^2 - 2bc.\cos A$$

$$\text{oppervlakte } \Delta ABC = \frac{1}{2}ab.\sin C$$

$$\sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta \qquad \sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta$$

$$\cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases} \qquad \sin 2\alpha = 2\sin\alpha.\cos\alpha$$

$$\bar{x} = \frac{\sum fx}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)} \qquad P(A \text{ of } B) = P(A) + P(B) - P(A \text{ en } B)$$

$$\hat{y} = a + bx \qquad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$